

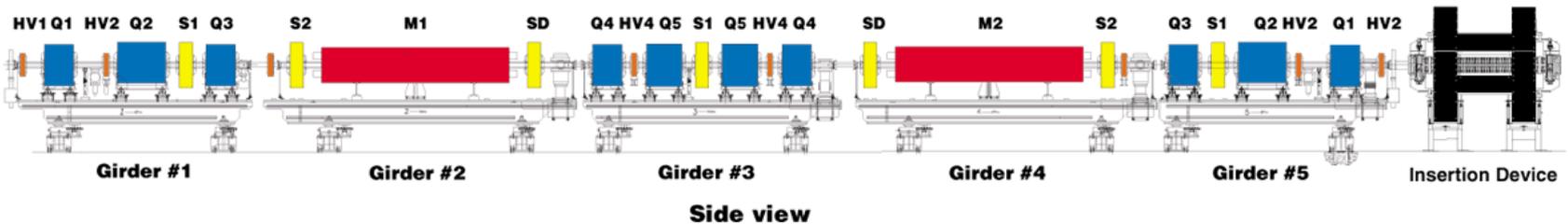
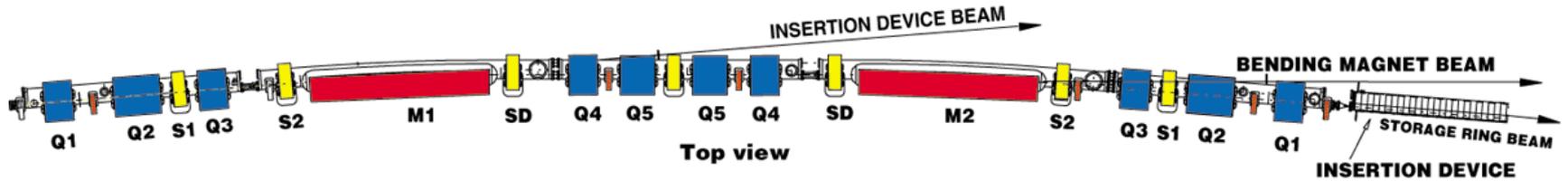
Storage Ring Insertion Device Considerations

Advanced Photon Source

Glenn Decker



One Sector of the Advanced Photon Source Storage Ring



Ring Performance Parameters Affected by Insertion Device
Field Quality. *

Insertion Device Property	Ring Parameter Affected
Field Integral, $I_{1y,x} = \int B_{y,x} dl$	Horizontal/Vertical Beam Position Stability
Second Field Integral, $I_{2y,x} = \int \int B_{y,x} dl dl'$	Horizontal/Vertical Beam Position Stability
Quadrupole Integral, $\int dB_y/dx dl$	Tune, Beam Size
Skew Quadrupole Integral, $\int dB_x/dx dl$	Coupling, Beam Size
Sextupole Integral, $\int d^2 B/dx^2 dl$	Dynamic Aperture, Lifetime
Octupole Integral, $\int d^3 B/dx^3$	Dynamic Aperture, Lifetime

* Advanced Photon Source Insertion Device Field Quality and Multipole Error Specification
Y.Chae, G. Decker, 1995 Particle Accelerator Conference

Beam Stability Specification c. 1995

APS Storage Ring Beam Stability Requirements

Δx	$\Delta x'$	Δy	$\Delta y'$
$16 \mu m$	$1.2 \mu rad$	$4.4 \mu m$	$0.45 \mu rad$

APS Beam Stability Specification

1) Original engineering specification 5% of CDR beam size values

- 4.5 microns rms vertical (@ ID source points)
- 17 microns horizontal

2) With present low-emittance lattice, (1% coupling) this amounts to

- 590 nm / 120 nanoradians rms vertical <-----
- 12.6 microns / 900 nanoradians rms horizontal

The above apply in the frequency band from 5e-6 Hz to 30 Hz

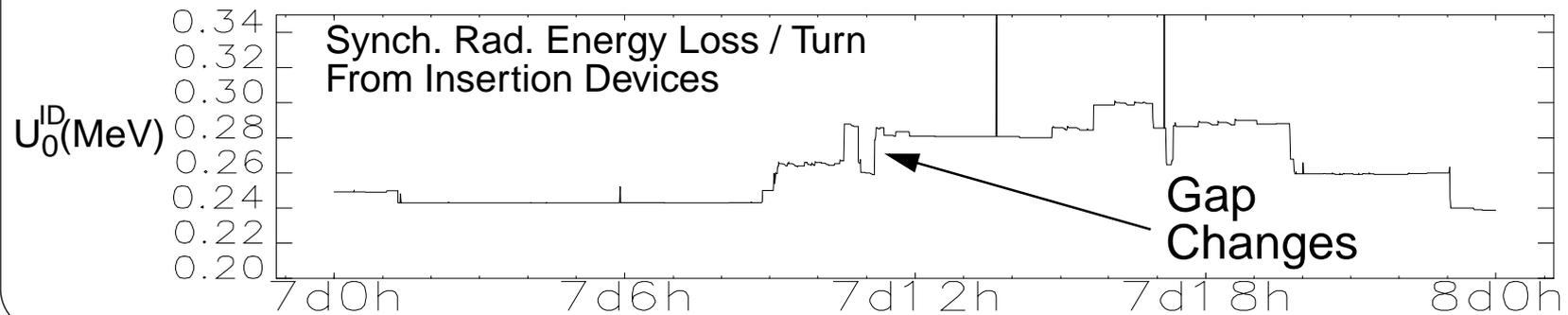
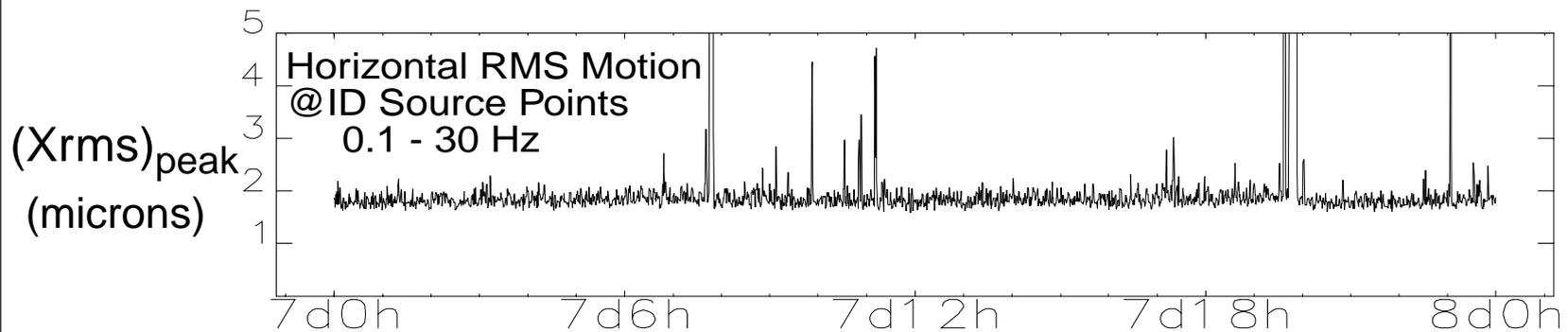
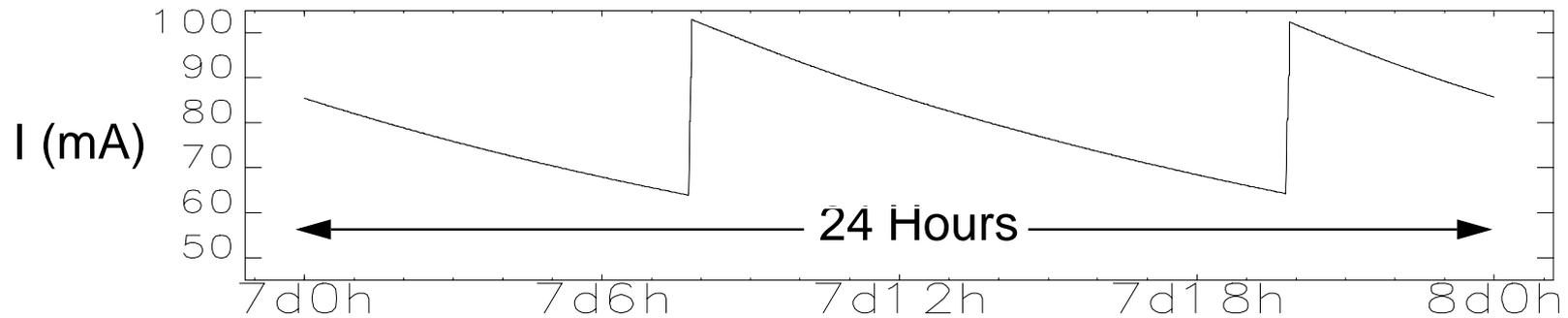
(1 / MTBF = 5e-6)

Table 4
ID Integrated Multipole Tolerance Specifications.*

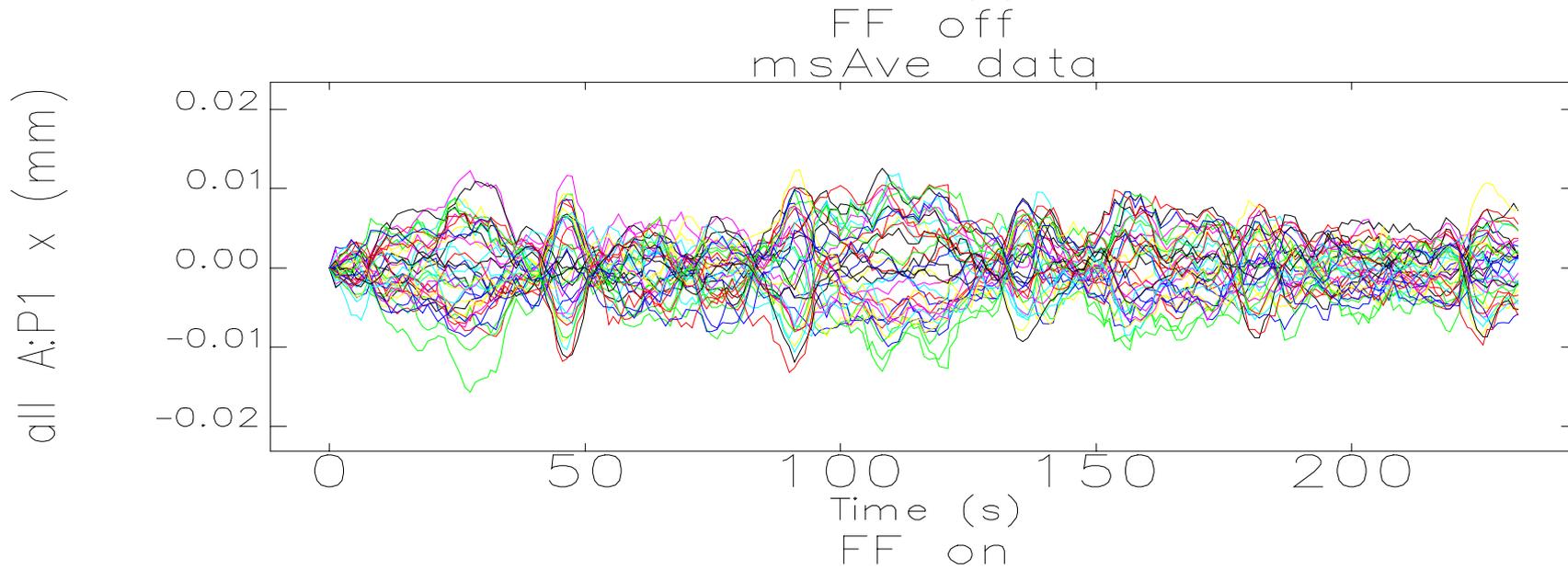
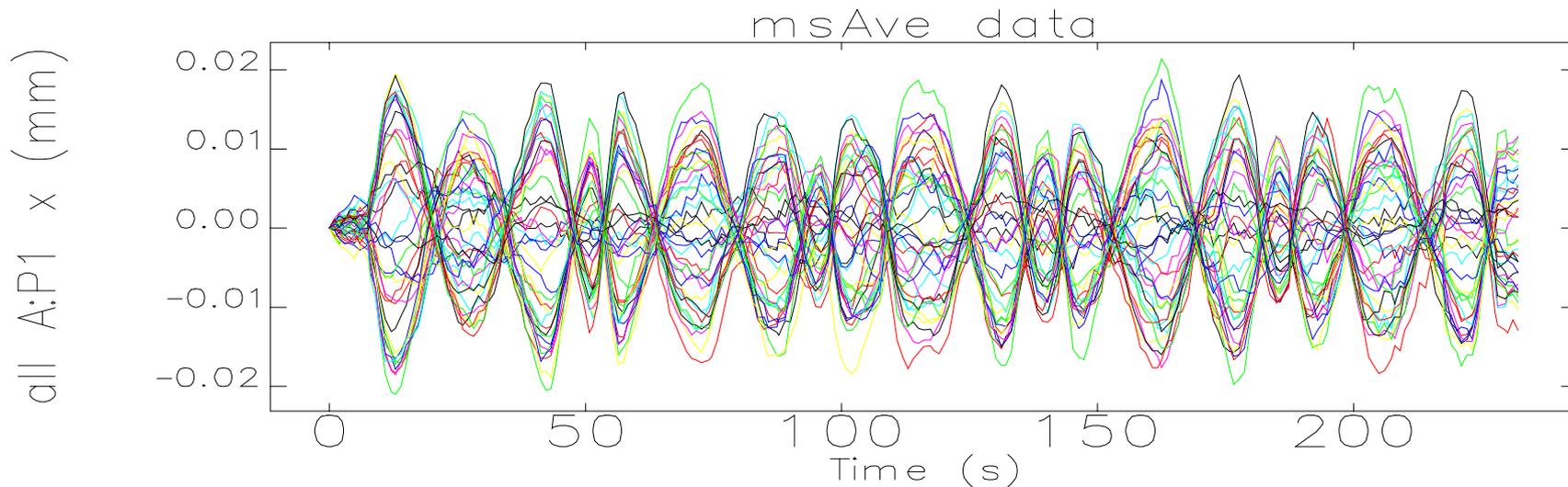
n	Normal Component $B_0 L b_n$	Skew Component $B_0 L a_n$
0	100 Gauss-cm	100 Gauss-cm
1	50 Gauss	50 Gauss
2	200 Gauss/cm	100 Gauss/cm
3	300 Gauss/cm ²	50 Gauss/cm ²

* Advanced Photon Source Insertion Device Field Quality and Multipole Error Specification
Y.Chae, G. Decker, 1995 Particle Accelerator Conference

Stored Beam Current

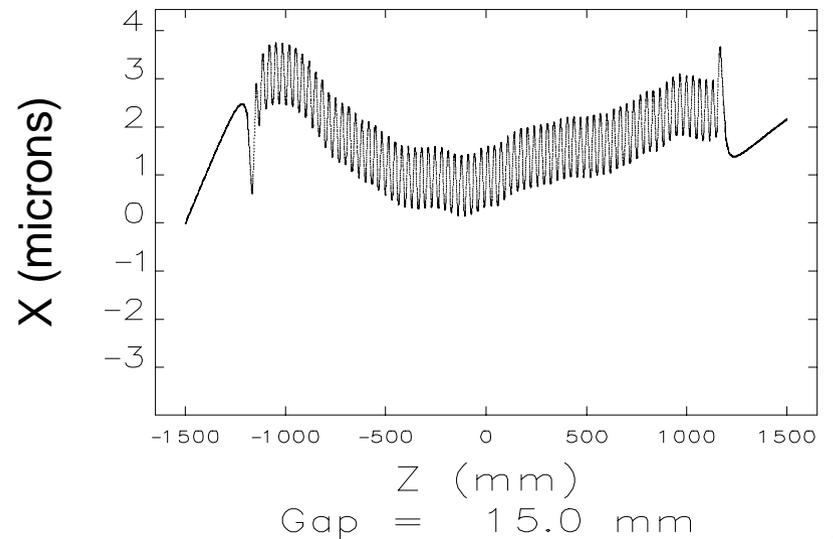
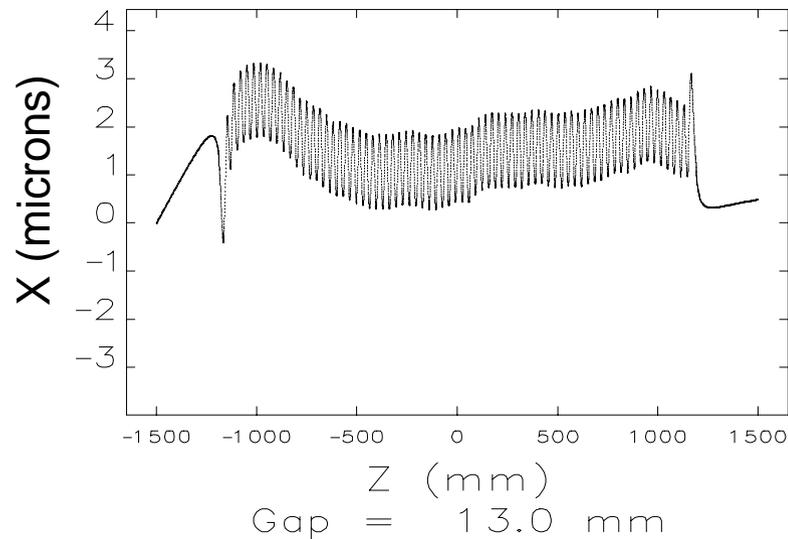
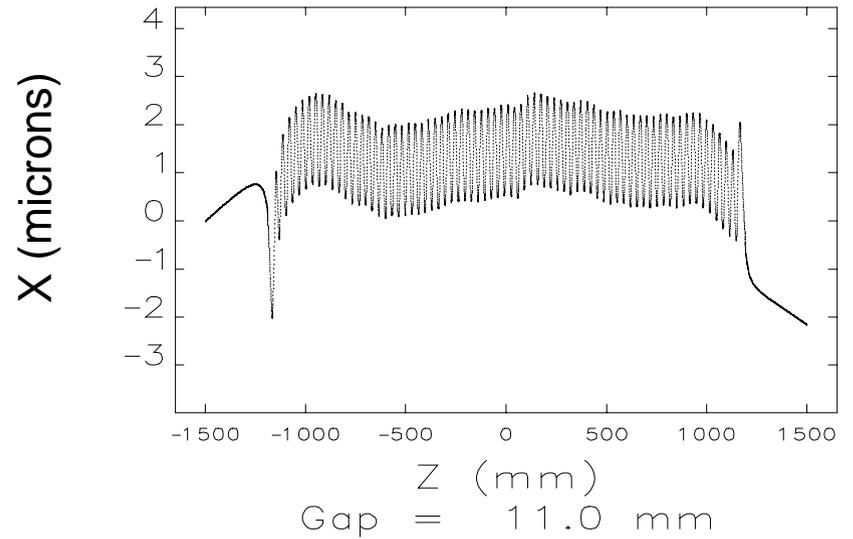
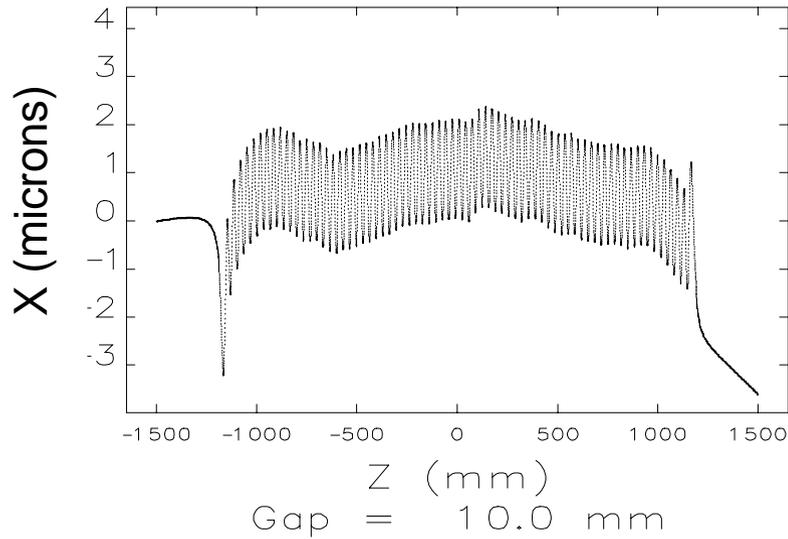


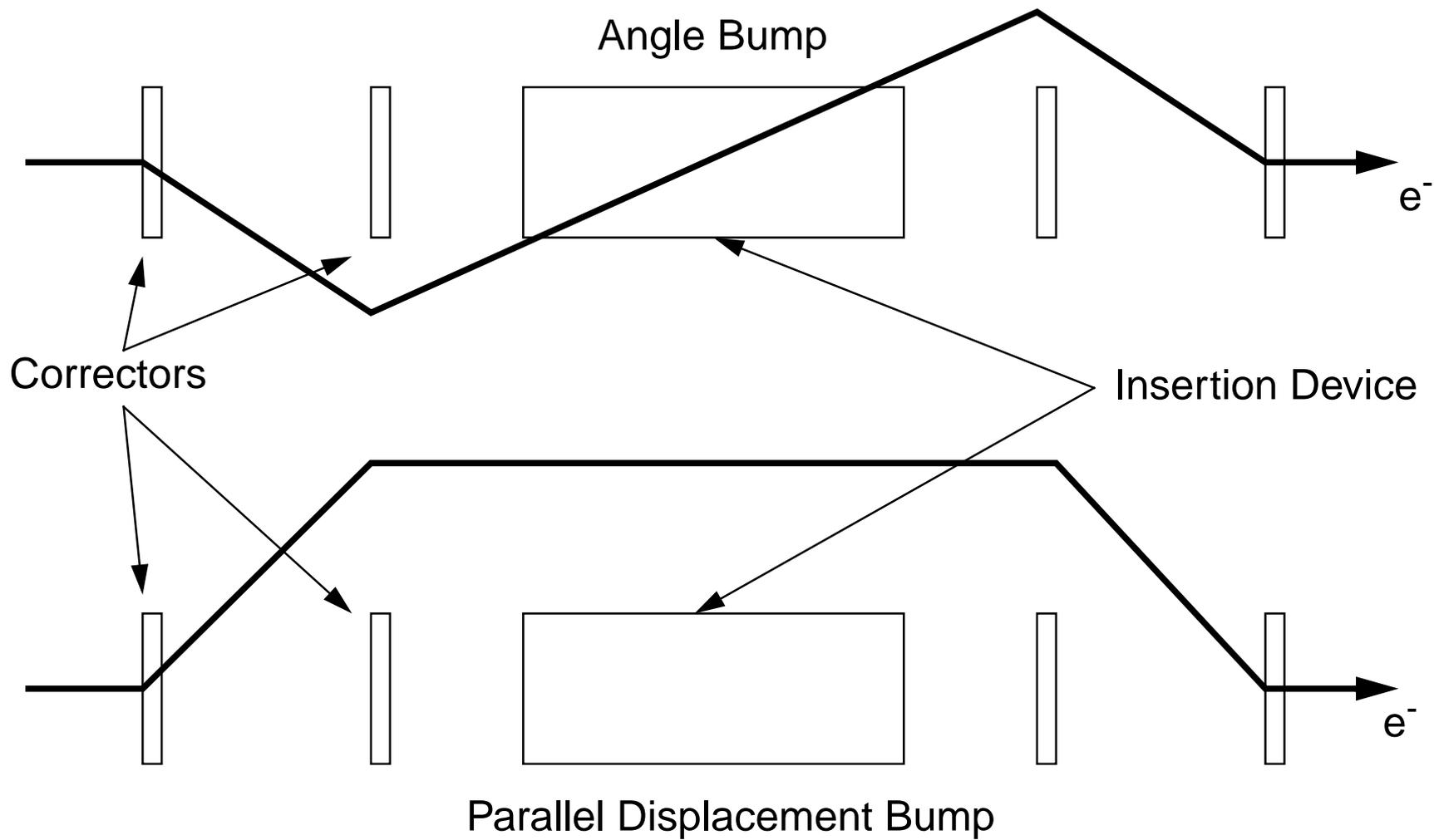
Variation of RF bpm's while cycling 33ID from 15 to 30 mm gap- FF on vs off



Variation of Particle Trajectory Through Insertion Device vs Gap

(Derived from Second Field Integral of Magnetic Measurement Data)





Stored Beam Current

